

Global EMC Inc. Labs EMC & RF Test Report

As per

RSS 210 Issue 8:2010

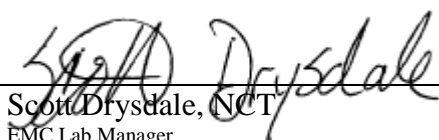
&

FCC Part 15 Subpart C:2011

Unlicensed Intentional Radiators

on the

VTP transceiver card



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Testing produced for



See Appendix A for full customer & EUT details.





Client	Viconics Technologies	
Product	VTP transceiver card	
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2011	

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Client	Viconics Technologies	
Product	VTP transceiver card	
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2011	

Report Scope

This report addresses the EMC verification testing and test results of the VTP Transceiver card, herein referred to as EUT (Equipment Under Test) performed at Global EMC Labs.

The EUT was tested for compliance against the following standards:


RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2011

Test procedures, results, justifications, and engineering considerations, if any, follow later in this report.

The results contained in this report relate only to the item(s) tested.

This report does not imply product endorsement by A2LA or any other accreditation agency, any government, or Global EMC Inc.


Opinions/interpretations expressed in this report, if any, are outside the scope of Global EMC Inc accreditation. Any opinions expressed do not necessarily reflect the opinions of Global EMC Inc, unless otherwise stated.

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Summary


The results contained in this report relate only to the item(s) tested.

EUT FCC Certification #, FCC ID:	V95-VTP
EUT Industry Canada Certification #, IC:	7591A-VTP
EUT Passed all tests performed.	Yes (see test results summary)
Tests conducted by	Scott Drysdale

Client	Viconics Technologies	
Product	VTP transceiver card	
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2011	


Test Results Summary

Standard/Method	Description	Class/Limit	Result
FCC 15.203	Antenna Requirement	Unique	Pass See Justification
FCC 15.205 RSS 210 (Table 1)	Restricted Bands for intentional operation	QuasiPeak Average	Pass
FCC 15.207	Power line conducted emissions	QuasiPeak Average	Pass
FCC 15.209 RSS-210 (Table 2)	Spurious Radiated emissions	QuasiPeak Average	Pass
FCC 15.247(a)2 RSS-210 A8.2(a)	6 dB Bandwidth	> 500 kHz	Pass
FCC 15.247(b)2 RSS-210 A8.4(4)	Max output power	< 1 Watt	Pass
FCC 15.247(b)(4) RSS-210 A8.4(5)	Antenna Gain	< 6 dBi	Pass See Justifications
FCC 15.247(d) RSS-210 A8.5	Antenna conducted spurious	< 20 dBc	Pass
FCC 15.247(e) RSS-210 A8.2(b)	Spectral Density	< 8 dBm (3 kHz BW)	Pass
FCC 15.247(i) IC Safety code 6	Maximum Permissible Exposure	< 20 mW (No restrictions)	Pass See justification
Overall Result			PASS

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All tests were performed by Scott Drysdale.

If the product as tested or otherwise complies with the specification, the EUT is deemed to comply with the requirement and is deemed a 'PASS' grade. If not 'FAIL' grade will be issued. Note that 'PASS' / 'FAIL' grade is independent of any measurement uncertainties. A 'PASS' / 'FAIL' grade within measurement uncertainty is marked with a '*'.

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Justifications, Descriptions, or Deviations

The following justifications for tests not performed or deviations from the above listed specifications apply:

The module was tested in both transmit and standby (receive) mode. No difference in emissions below 2 GHz were observed, and the worst case (transmit) mode is presented as representative for both modes. In standby mode, no emissions were detected above 2 GHz.

For the Antenna requirement specified in FCC 15.203 and RSS 210 section 5.5, this device uses a PCB trace antenna with a gain of less than 1 dBi.

For the Restricted Bands of operation, the EUT is designed to only operate between 2.4 GHz and 2.4835 GHz.

For the power line conducted emissions requirements, the EUT (limited module) is DC powered, and this test does not apply to the module. However the EUT was tested in the host platform for conducted emissions as presented in this test report.

For the scope of this testing the EUT was mounted horizontally and vertically to maximize emissions. Maximum emissions were found in the horizontal EUT polarization. This setup was used for all testing in this report.

For maximum permissible exposure, this device does not exceed the $60 / f$ (GHz) in mW limit as per FCC KDB 447498 2(a)(i), so it is allowable to be used in portable exposure conditions with no restrictions on host platforms.


The EUT is not a hybrid system and FCC 15.247 (f) does not apply. However the 15.247 (d) requirement of power density were met and are detailed later in this test report.

The RF transceiver is installed in VT(r)xxxxyzzzzP series of thermostats which have the same enclosure, electronics, rf module and all other electronics installed in them. The modular transmitter was tested in a representative VT7656B5500P Host Chassis which is the same enclosure type as all the other VT(r)xxxxyzzzzP chassis. This shows that the VT7656B5500P unit and the product family VT(r)xxxxyzzzzP are capable of complying with Part 15 emission limits regardless of the VT(r)xxxxyzzzzP thermostat into which it is eventually installed.

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Applicable Standards, Specifications and Methods

- ANSI C63.4:2003 - Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz
- ANSI C63.10:2009 - American national standard for testing unlicensed wireless devices
- CFR 47 FCC 15 - Code of Federal Regulations – Radio Frequency Devices
- CISPR 22:1997 - Information technology equipment – Radio disturbance characteristics – Limits and methods of measurement
- FCC KDB 558074 - FCC KDB 558074 Digital Transmission Systems, measurements and procedures (Revision 2)
- ICES-003:2004 - Digital Apparatus - Spectrum Management and Telecommunications Policy Interference-Causing Equipment Standard
- ISO 17025:2005 - General Requirements for the competence of testing and calibration laboratories
- RSS 210:2010 - Issue 8: Spectrum Management and Telecommunications Policy. Radio Standards Specification Low Power Licence-Exempt Radiocommunication Devices

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Sample calculation(s)


Margin = limit – (received signal + antenna factor + cable loss – pre-amp gain)

Margin = 50.5dBuV/m – (50dBuV + 10dB + 2.5dB – 20dB)

Margin = 8.5 dB

Document Revision Status

Revision 1 - Nov, 12 2012

Client	Viconics Technologies	
Product	VTP transceiver card	
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2011	

Definitions and Acronyms

The following definitions and acronyms are applicable in this report.
See also ANSI C63.14.

AE – Auxillary Equipment.

BW – Bandwidth. Unless otherwise stated, this refers to the 6 dB bandwidth.

EMC – Electro-Magnetic Compatibility

EMI – Electro-Magnetic Immunity

EUT – Equipment Under Test

ITE – Information Technology Equipment with a primary function(s) of entry, storage, display, retrieval, transmission, processing, switching, or control, of data.

LISN – Line impedance stabilization network

NCR – No Calibration Required

RF – Radio Frequency


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Testing Facility

Testing for EMC on the EUT was carried out at Global EMC labs in Toronto, Ontario, Canada. The testing lab consists of a 3m semi-anechoic chamber calibrated to be able to allow measurements on an EUT with a maximum width or length of up to 2m and height up to 3m. The chamber is equipped with a turn table that is capable of testing devices up to 3300lb in weight. This facility is capable of testing products that are rated for 120 Vac and 240Vac single phase, or 208 Vac 3 phase input. DC capability is also available. The chamber is equipped with an antenna mast that controls polarization and height from the control room adjoining the shielded chamber. Radiated emissions measurements are performed using a Bilog, and Horn antenna where applicable. Conducted emissions, unless otherwise stated, are performed using a LISN.

Calibrations and Accreditations


The measurement site used is registered with Federal Communications Commission (FCC) and Industry Canada (IC). This site is calibrated for Normalized Site Attenuation (NSA) using test procedures outlined in ANSI C63.4 “Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz”. The semi-anechoic chamber is lined with ferrite tiles and absorption cones to minimize any undesired reflections. All measuring equipment is calibrated on an annual or bi-annual basis as listed for each respective test.

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Testing Environmental Conditions and Dates

Following were the environmental conditions in the facility during time of testing –

Date	Test	Init.	Temperature (°C)	Humidity (%)	Pressure (kPa)
Aug 16, 2012 Sept 6, 2012	RE	SD	20-25°C	30-45%	100 -103kPa
Sept 9, 2012	PLCE	SD	20-25°C	30-45%	100 -103kPa
Sept 9, 2012	Ant. Conducted	SD	20-25°C	30-45%	100 -103kPa

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Detailed Test Results Section

Client	Viconics Technologies	
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Power Line Conducted Emissions

Purpose

The purpose of this test is to ensure that the RF energy unintentionally emitted from the EUT's power line does not exceed the limits listed below as defined in the applicable test standard, as measured from a LISN. This helps protect lower frequency radio services such as AM radio, shortwave radio, amateur radio operators, maritime radio, CB radio, and so on, from unwanted interference.

Limits & Method

The limits are as defined in 47 CFR FCC Part 15 Section 15.207


Method is as defined in ANSI C64:2003

Average Limits		QuasiPeak Limits	
150 kHz – 500 kHz	56 to 46 dBuV	150 kHz – 500 kHz	66 to 56 dBuV
500 kHz – 5 MHz	46 dBuV	500 kHz – 5 MHz	56 dBuV
5 MHz – 30 MHz	50 dBuV	500 kHz – 30 MHz	60 dBuV

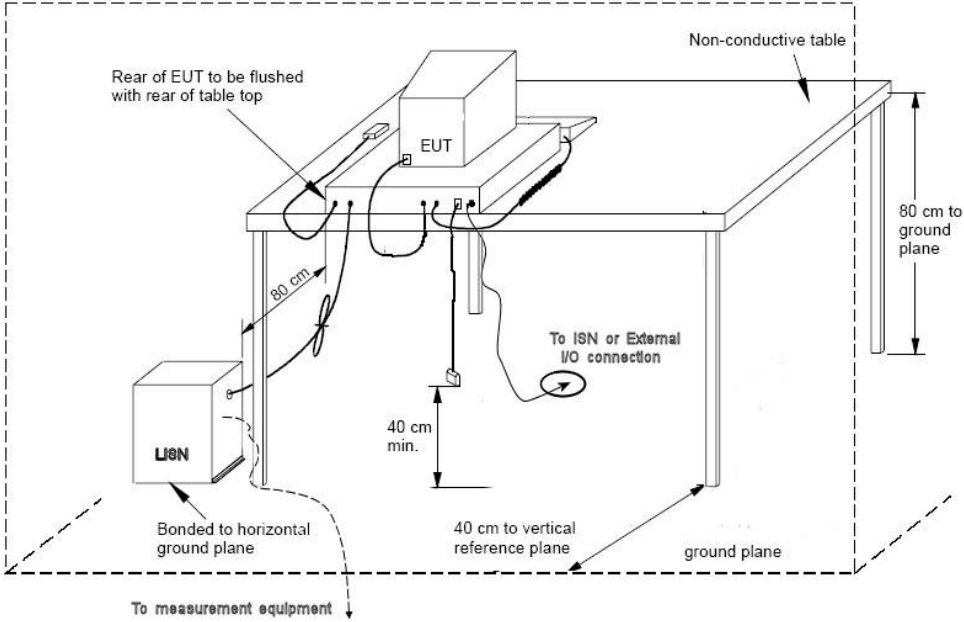
The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz.

Note: If the Peak or Quasi Peak detector measurements do not exceed the Average limits, then the EUT is deemed to have passed the requirements.

Both limits are applicable, and each is specified as being measured with a 9 kHz measurement bandwidth .

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Typical Setup Diagram




Measurement Uncertainty

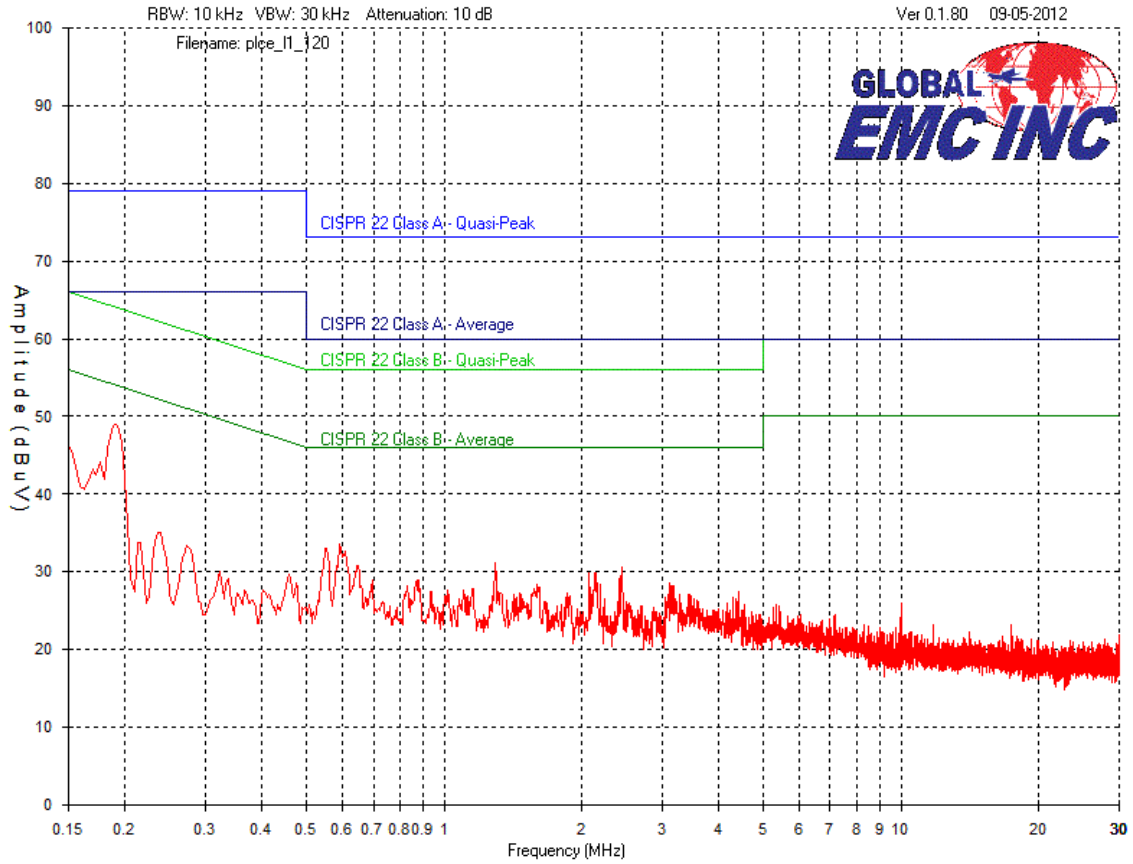
The expanded measurement uncertainty is calculated in accordance with CISPR 16-4-2 and is +/-3.6 dB with a 'k=2' coverage factor and a 95% confidence level.


Preliminary Graphs

Note the graphs shown below are for graphical illustration only. For final measurements with the appropriate detector where applicable, please refer to the table. The graph shown below is a peak measurement graph, measured with a resolution bandwidth greater than or equal to the final required detector. These graphs are performed as a worst case measurement to enable the detection of frequencies of concern and for considerable time savings.

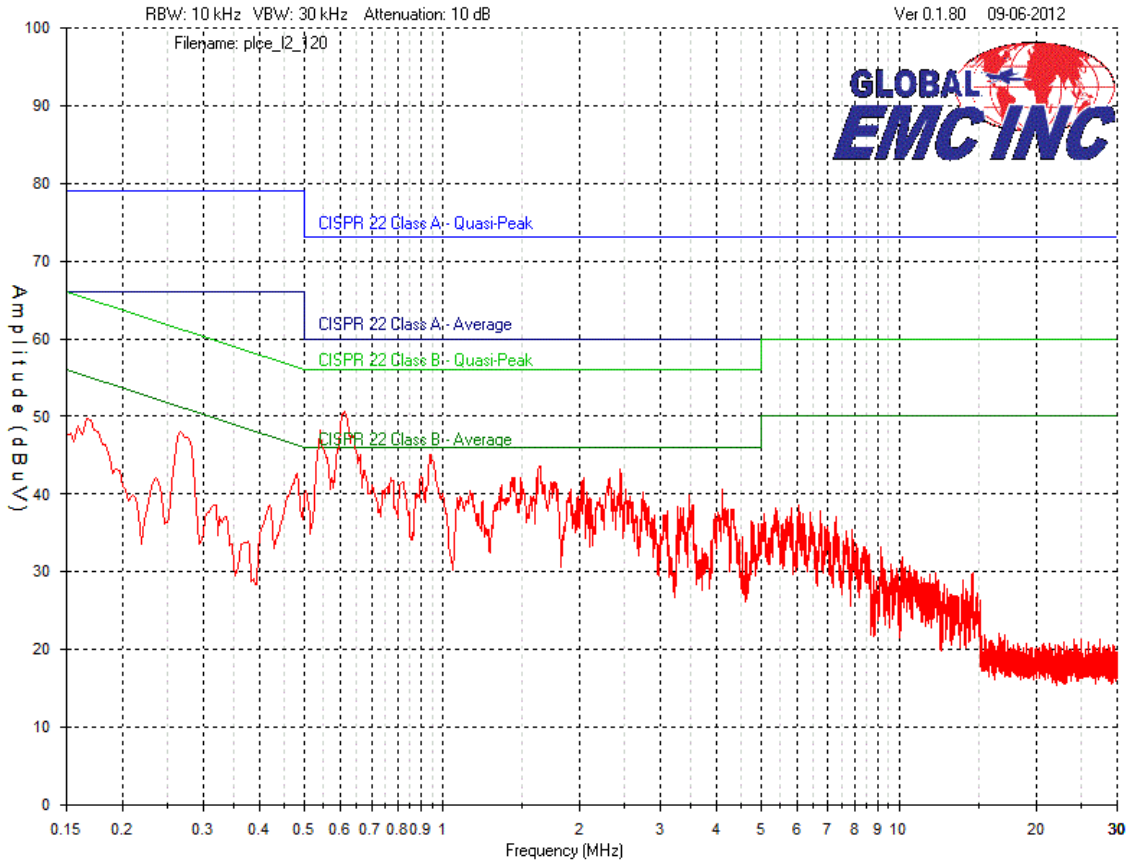
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Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2011	


Phase (Black/Brown) – Power Supply 1



Client	Viconics Technologies	
Product	VTP transceiver card	
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2011	

Neutral (White/Blue) – Power Supply 1



Client	Viconics Technologies	
Product	VTP transceiver card	
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2011	

Final Measurements

Line 1 – Phase (Black/Brown) – 120 Vac, 60 Hz


Frequency (MHz)	Det.	Raw (dBuV)	Atten Factor (dB)	LISN Factor (dB)	Cable (dB)	Level (dBuV)	Limit (dB)	Margin (dB)	Pass/Fail
0.1899	PK	37.8	10	0.1	1.1	49	54	5	Pass
0.592	PK	23.3	10	0.1	0.2	33.6	46	12.4	Pass
0.5521	PK	22.7	10	0.1	0.2	33	46	13	Pass
1.2965	PK	20.9	10	0.1	0.2	31.2	46	14.8	Pass
2.4531	PK	20.2	10	0.1	0.2	30.5	46	15.5	Pass
2.0775	PK	19.5	10	0.1	0.2	29.8	46	16.2	Pass

Line 2 – Neutral (White/Blue) – 120 Vac, 60 Hz

Frequency (MHz)	Det.	Raw (dBuV)	Atten Factor (dB)	LISN Factor (dB)	Cable (dB)	Level (dBuV)	Limit (dB)	Margin (dB)	Pass/Fail
0.598	AV	33.4	10	0.1	0.2	43.7	46	2.3	Pass
0.5388	AV	31.9	10	0.1	0.2	42.2	46	3.8	Pass
0.941	AV	30.8	10	0.1	0.2	41.1	46	4.9	Pass
1.6289	PK	33.3	10	0.1	0.2	43.6	46	2.4	Pass
2.4564	PK	32.9	10	0.1	0.2	43.2	46	2.8	Pass
0.2663	PK	37.2	10	0.1	0.7	48	51.2	3.2	Pass

No peak emissions exceeded the quasi-peak limits, therefore the unit was deemed to meet the quasi peak requirements based on the peak emissions. The tables above represent the average (AV) or peak readings (PK) with respect to the average limit.


Note: See ‘Appendix B – EUT & Test Setup Photographs’ for photos showing the test set-up for the highest line conducted emission

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Test Equipment List

Equipment	Model No.	Manufacturer	Last calibration date	Next calibration due date	Asset #
Spectrum Analyzer	ESL 6	Rohde & Schwarz	Oct-06, 2011	Oct-06, 2013	GEMC 160
LISN	FCC-LISN-50/250-16-2-01	FCC	Feb 03, 2011	Feb 03, 2013	GEMC 65
RF Cable 7m	LMR-400-7M-50OHM-MN-MN	LexTec	NCR	NCR	GEMC 28
RF Cable 1m	LMR-400-1M-50OHM-MN-MN	LexTec	NCR	NCR	GEMC 29
Attenuator 10 dB	FP-50-10	Trilithic	NCR	NCR	GEMC 42

This report module is based on GEMC template "FCC – Power Line Conducted Emissions Class B_Rev1"

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Radiated Emissions

Purpose

The purpose of this test is to ensure that the RF energy unintentionally emitted from the EUT does not exceed the limits listed below as defined in the applicable test standard, as measured from a receiving antenna. This helps protect broadcast radio services such as television, FM radio, pagers, cellular telephones, emergency services, and so on, from unwanted interference.

Limit(s) and Method

The method is as defined in ANSI C63.4:2003.


The limits are as defined in FCC Part 15, Section 15.209:

0.009 MHz – 0.490 MHz, 2400/F(kHz) uV/m at 300 m¹
0.490 MHz – 1.705 MHz, 24000/F(kHz) uV/m at 30 m¹
1.705 MHz – 30 MHz, 30 uV/m at 30 m¹
30 MHz – 88 MHz, 100 uV/m (40.0 dBuV/m¹) at 3 m
88 MHz – 216 MHz, 150 uV/m (43.5 dBuV/m¹) at 3 m
216 MHz – 960 MHz, 200 uV/m (46.0 dBuV/m¹) at 3 m
Above 960 MHz, 500 uV/m (54.0 dBuV/m¹) at 3 m
Above 1000 MHz, 500 uV/m (54 dBuV/m²) at 3m
Above 1000 MHz, 500 uV/m (74 dBuV/m³) at 3m

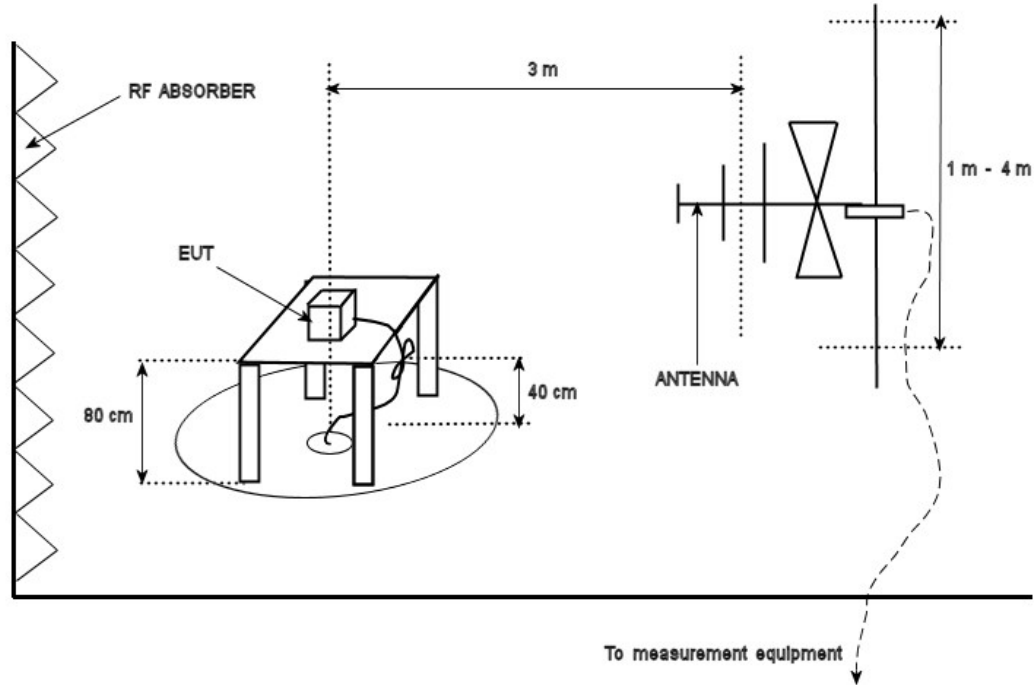
¹Limit is with Quasi Peak detector with bandwidths as defined in CISPR-16-1-1


²Limit is with 1 MHz measurement bandwidth and using an Average detector

³Limit is with 1 MHz measurement bandwidth and using a Peak detector

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Typical Radiated Emissions Setup



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Measurement Uncertainty


The expanded measurement uncertainty is calculated in accordance with CISPR 16-4-2 and is +/-4.4 dB with a 'k=2' coverage factor and a 95% confidence level.

Preliminary Graphs

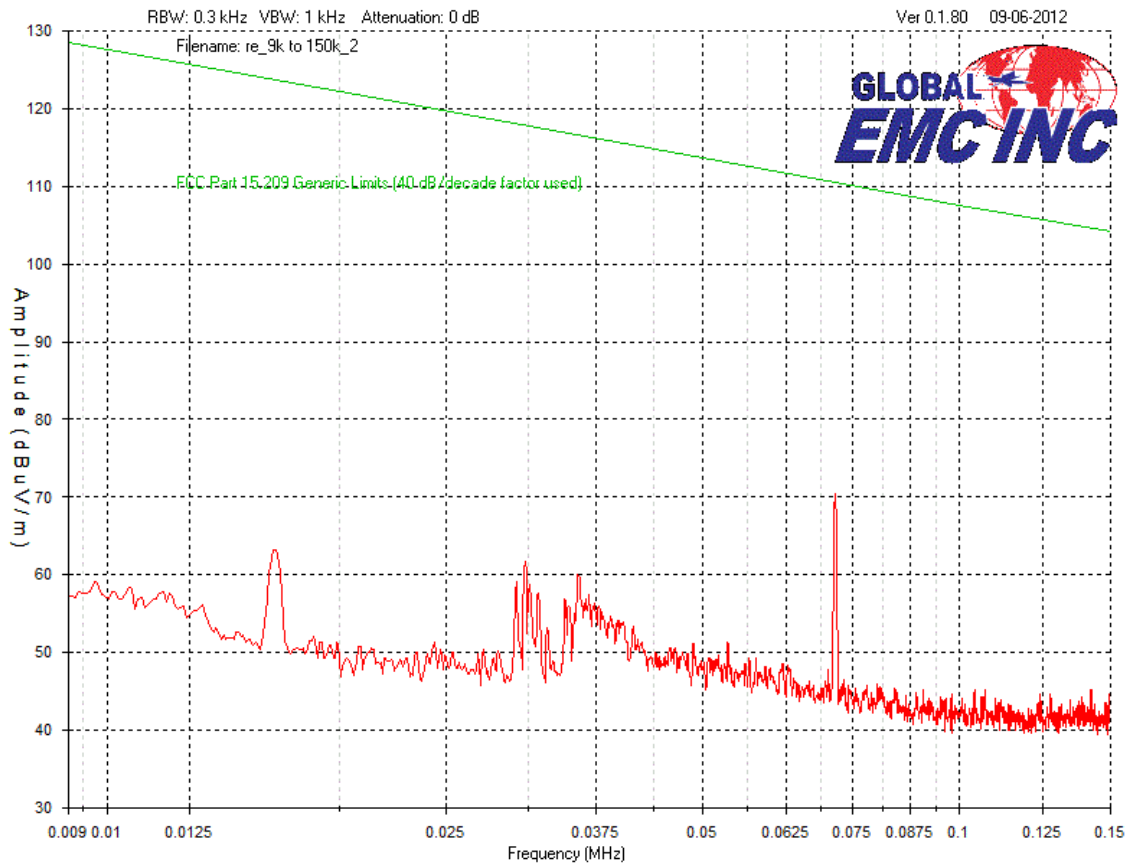
Note the graphs shown below are for graphical illustration only. For final measurements with the appropriate detector, please refer to the final measurement table where applicable. The graph shown below is a maximized peak measurement graph, measured with a resolution bandwidth greater than the final required detector and over a full 0-360 rotation. This peaking process is done as a worst case measurement. This process enables the detection of frequencies of concern for final measurement, and provides considerable time savings.


In accordance with FCC Part 15, Subpart A, Section 15.33, the device was scanned to the 10th harmonic (a minimum of a 25 GHz).

Devices scanned may be scanned at alternate test distances, and in accordance with FCC Part 15, Subpart A, Section 15.31, an extrapolation factor of 20 dB/decade was used above 30 MHz and 40 dB/decade below 30 MHz. For example for 1 meter measurements, an extrapolation factor 9.5 dB from 20 Log (1m / 3m) is applied.

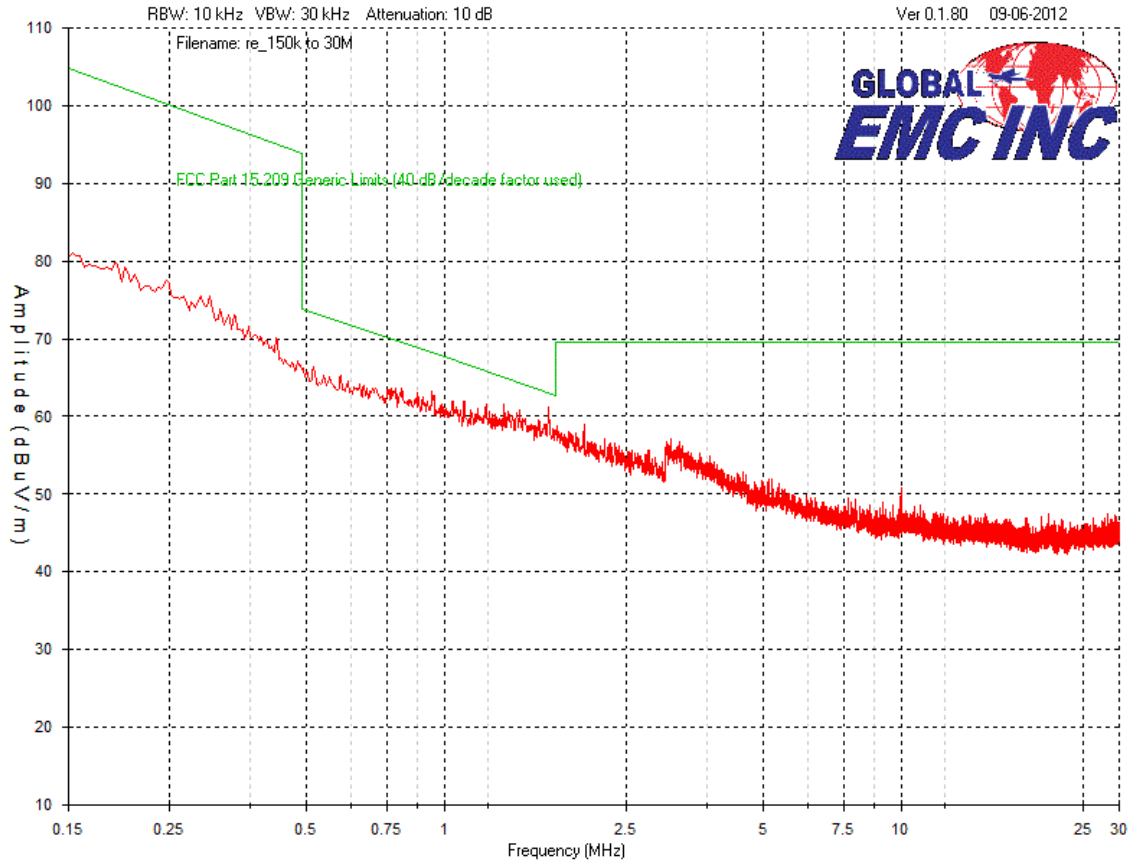
Client	Viconics Technologies	
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9 kHz to 150 kHz – Peak emissions graph



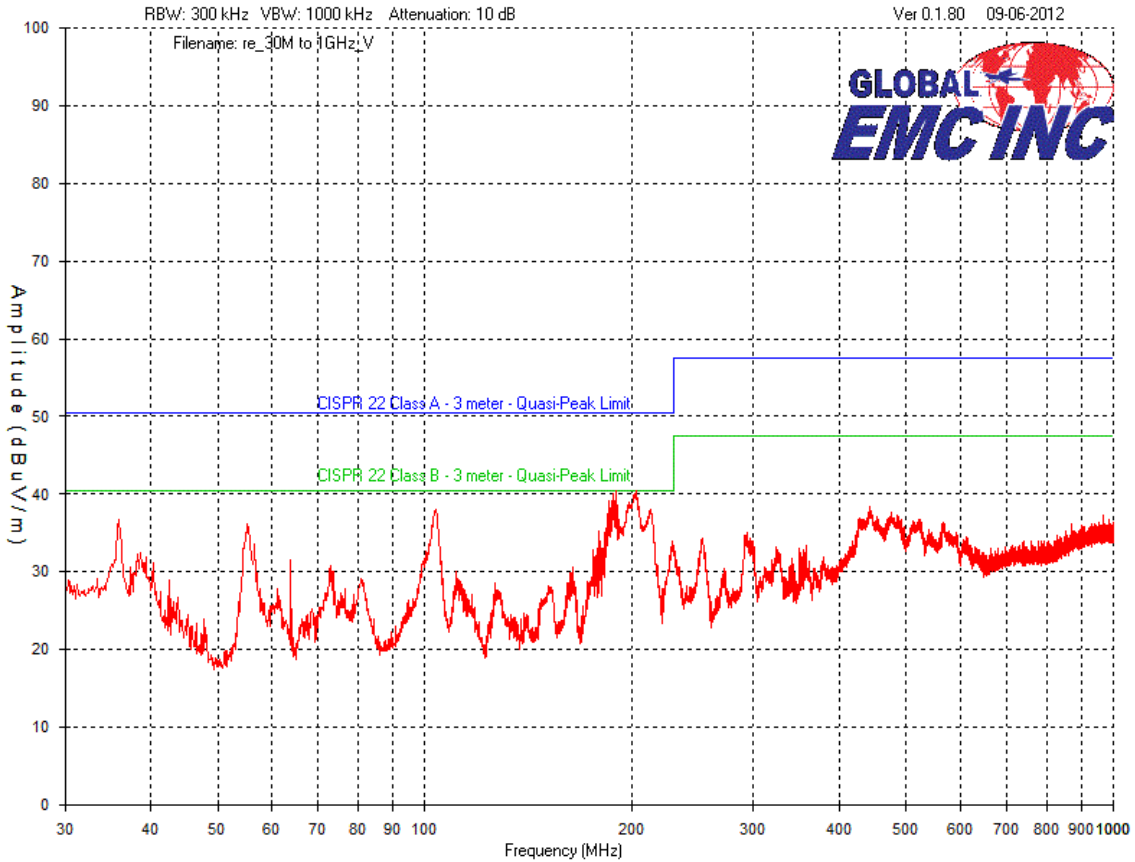
Client	Viconics Technologies	
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150 kHz to 30 MHz – Peak emissions graph




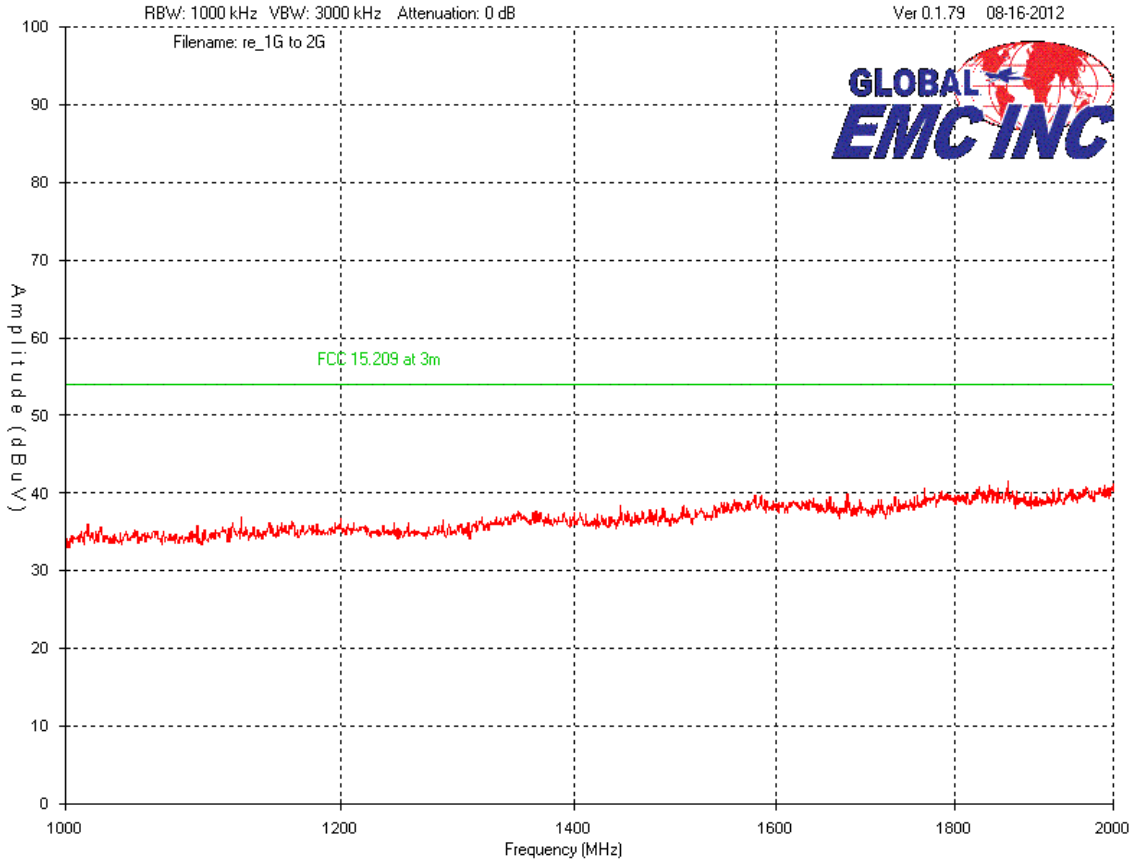
Client	Viconics Technologies	
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Vertical – Peak Emissions Graph

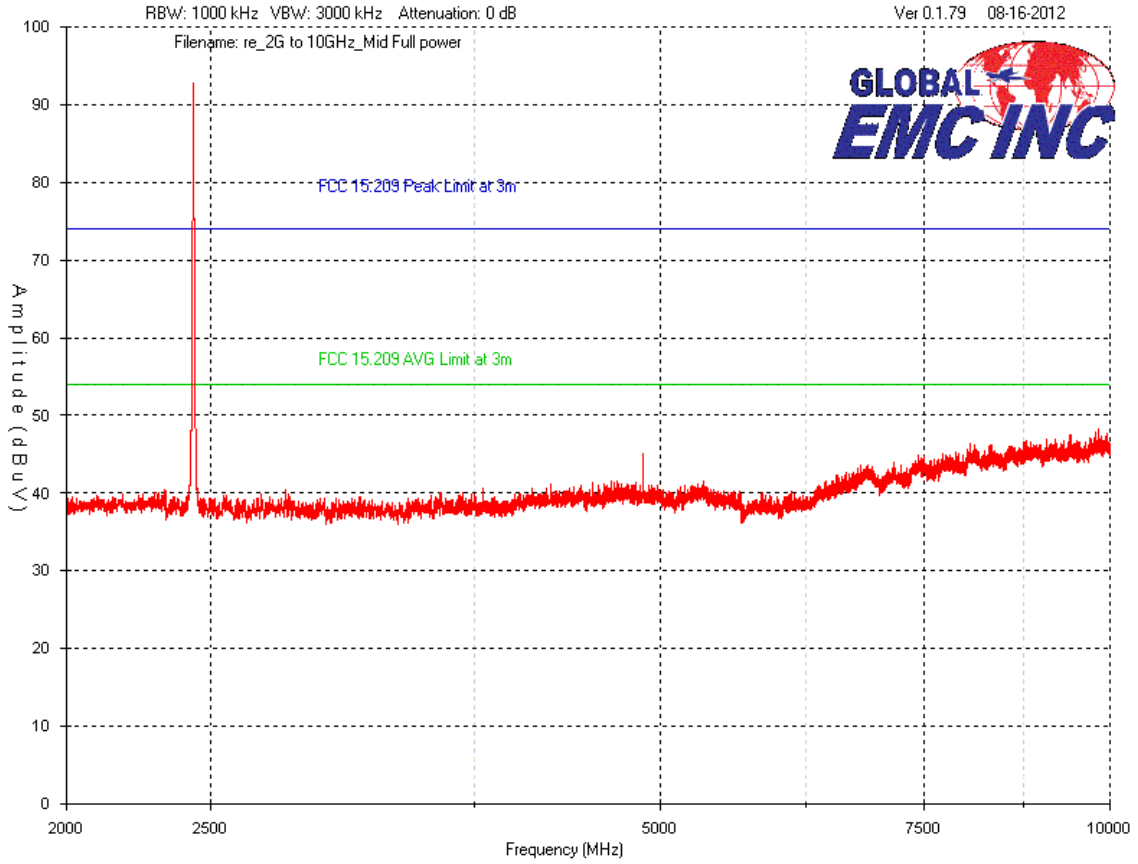



Note: The above graph shows the CISPR 22 limits, however for the applicable QuasiPeak measurements, as shown in the tables, the measurements were compared to the FCC limits as applicable.

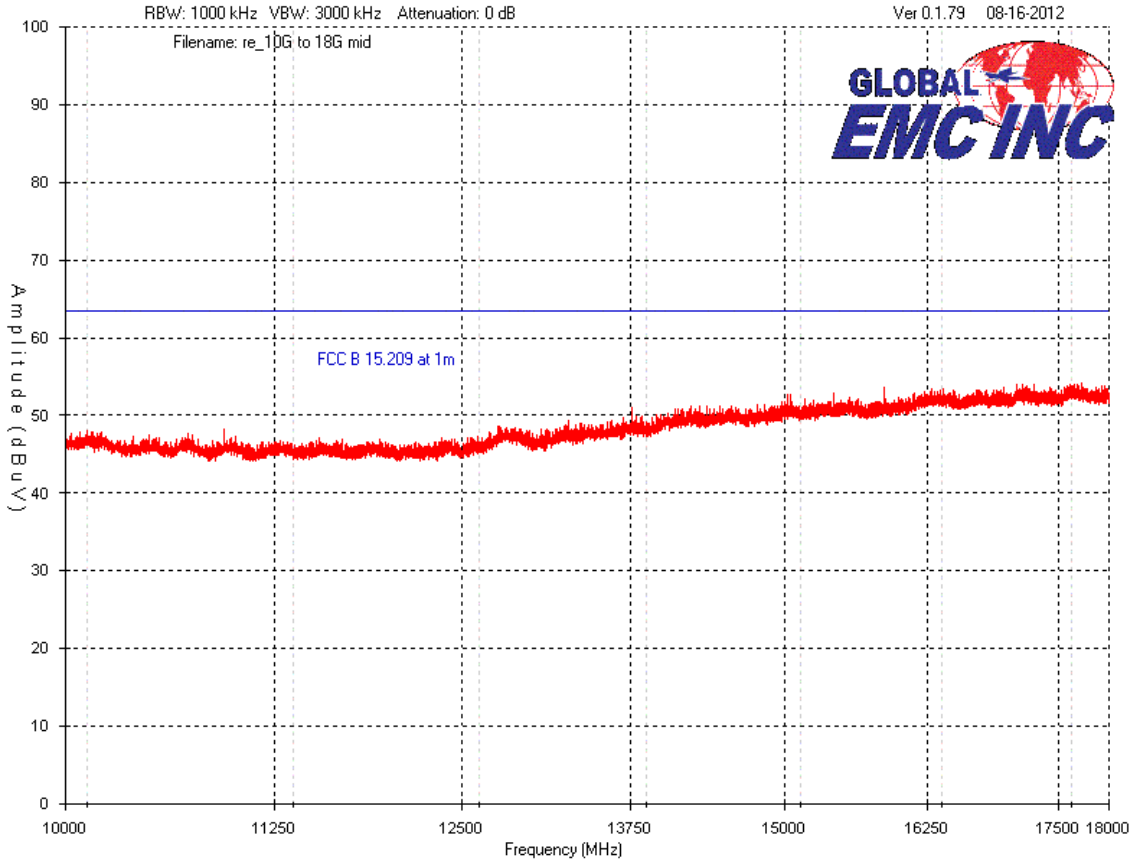
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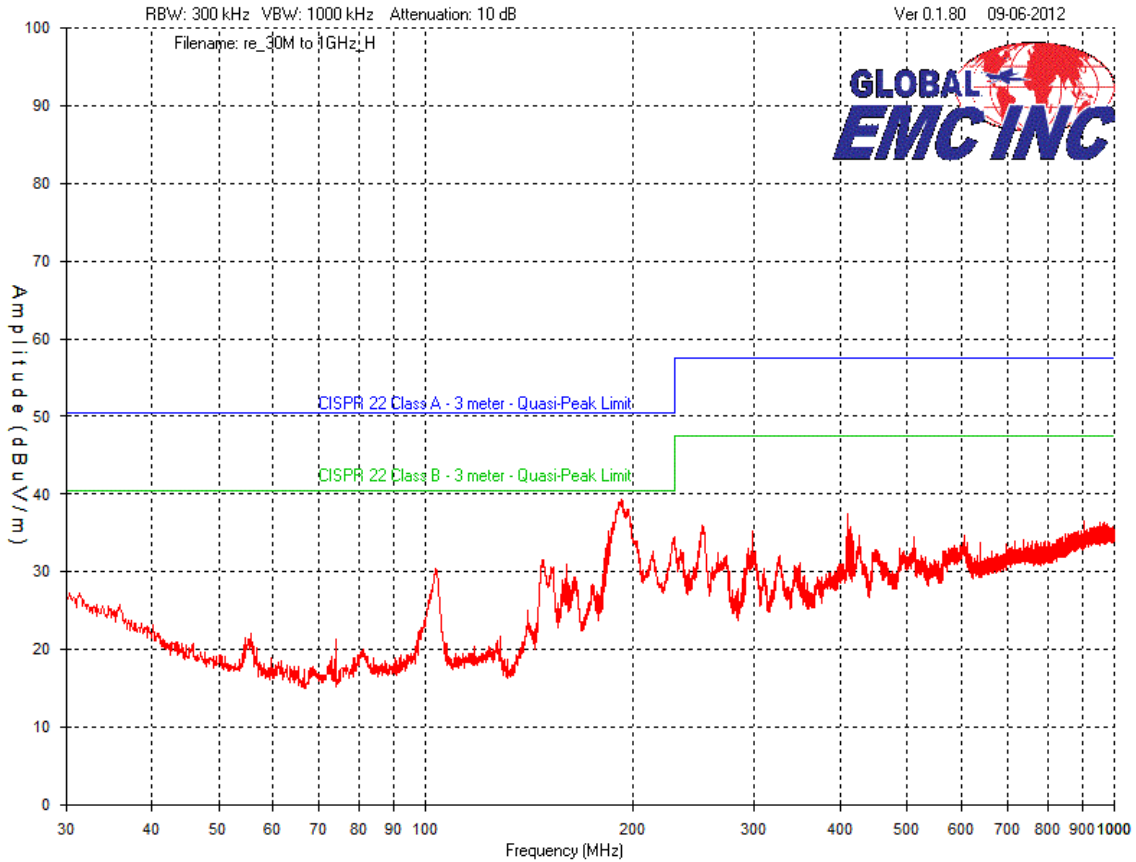
Client	Viconics Technologies	
Product	VTP transceiver card	
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2011	




No emissions were detected from 18GHz to 25 GHz.

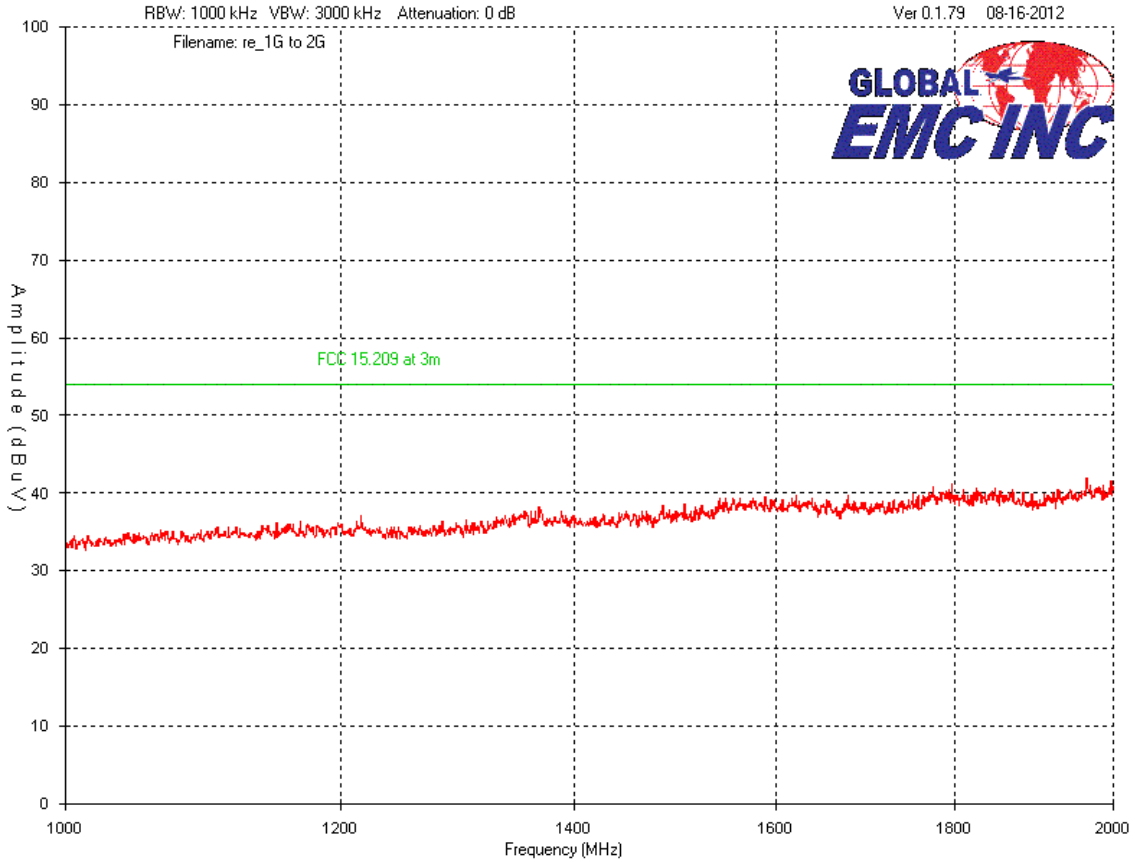
Client	Viconics Technologies	
Product	VTP transceiver card	
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2011	


Horizontal – Peak Emissions Graph

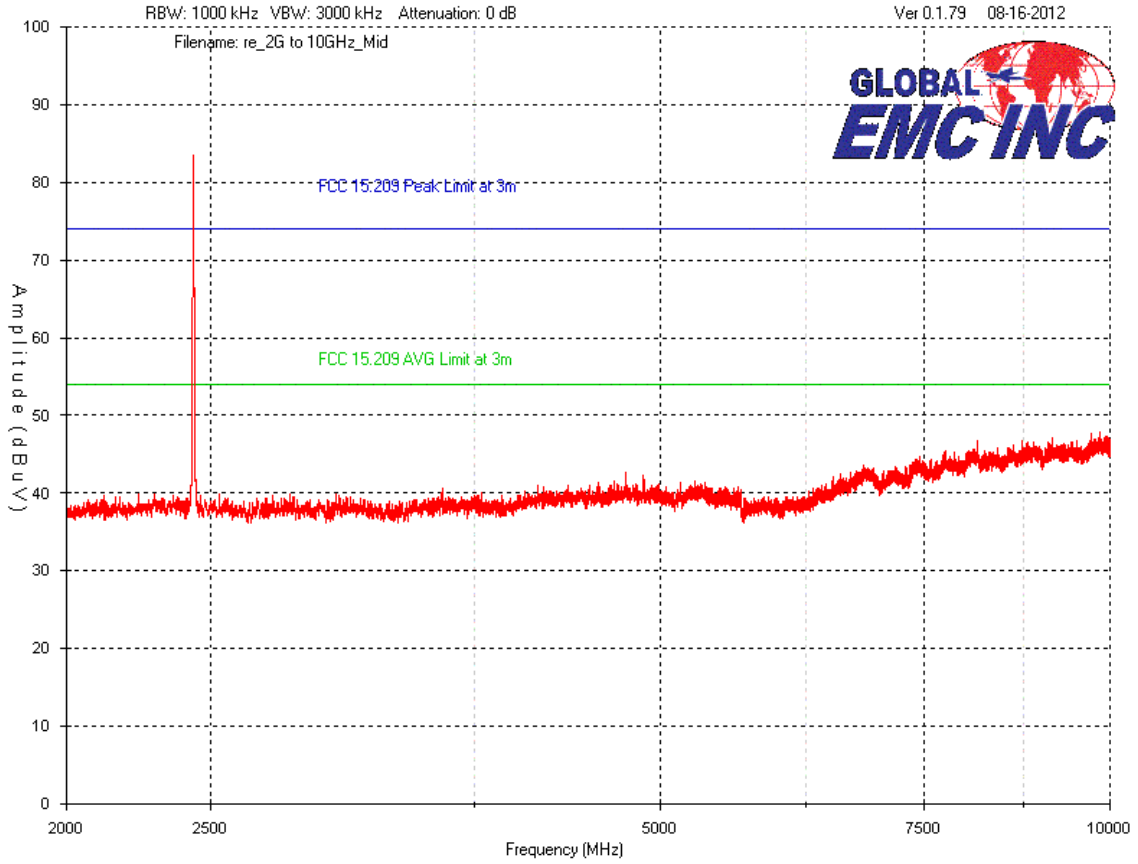



Note: The above graph shows the CISPR 22 limits, however for the applicable QuasiPeak measurements, as shown in the tables, the measurements were compared to the FCC limits as applicable.

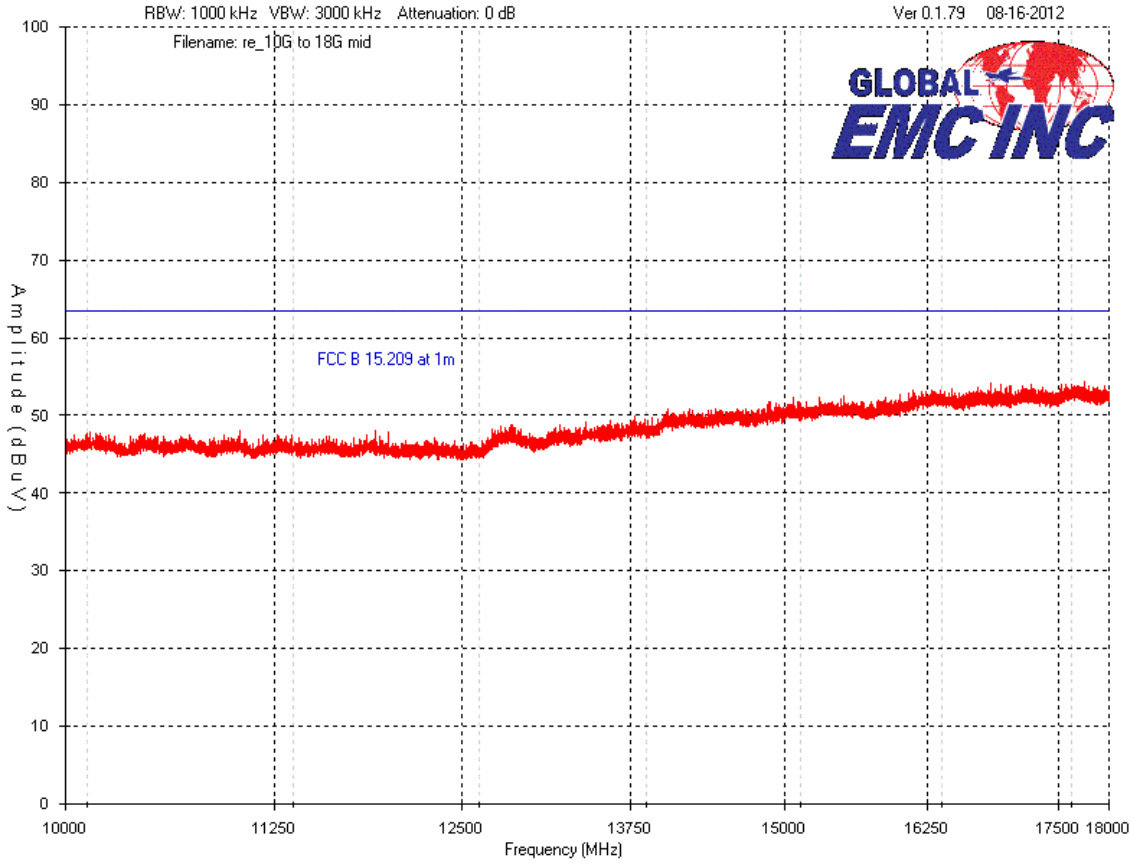
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No emissions were detected from 18GHz to 25 GHz.

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Final Measurements


For information purposes, the fundamental was measured to be 94.9 dBuV/m at 3 meters.

Final Emissions Table – Vertical

Frequency (MHz)	Det	Raw (dBuV)	Ant. (dB/m)	Cable	Amp (dB)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Pass/Fail
189.593	QP	44.5	10.9	0.5	-18.5	37.4	43.5	6.1	Pass
202.326	QP	44.8	10.5	0.6	-18.5	37.4	43.5	6.1	Pass
36.02	QP	38.1	14.9	0.3	-18.5	34.8	40	5.2	Pass
55.2705	PK	42.9	8.5	0.4	-18.5	33.3	40	6.7	Pass
103.673	PK	47.3	8.8	0.5	-18.5	38.1	43.5	5.4	Pass
443.465	PK	38.7	17.4	0.7	-18.4	38.4	46	7.6	Pass


Final Emissions Table (30MHz to 1 GHz) - Horizontal

Frequency (MHz)	Det	Raw (dBuV)	Ant. (dB/m)	Cable	Amp (dB)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Pass/Fail
192.217	QP	46.5	10.8	0.5	-18.5	39.3	43.5	4.2	Pass
410.03	PK	38.1	17.1	0.7	-18.4	37.5	46	8.5	Pass
903.097	PK	30	23.7	1.3	-18.5	36.5	46	9.5	Pass
252.284	PK	41.4	12.5	0.6	-18.5	36	46	10	Pass
412.752	PK	36.5	17.1	0.7	-18.4	35.9	46	10.1	Pass
297.576	PK	39.3	13.7	0.6	-18.4	35.2	46	10.8	Pass

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Test Frequency (MHz)	Detection mode (Q-Peak)	Antenna polarity (Horz/Vert)	Raw signal dB(μV)	Antenna factor dB	Cable loss dB + Preselector	Attenuator dB	Pre-Amp Gain dB	Received signal dB(μV/m)	Emission limit dB(μV/m)	Margin dB(μV)	Result
Low Channel 2405											
2405	Peak	Horz	96.3	30.6	2.2	0.0	36.2	92.9			PASS
2405	Avg	Horz	93.2	30.6	2.2	0.0	36.2	89.8			PASS
2405	Peak	Vert	98.3	30.6	2.2	0.0	36.2	94.9			PASS
2405	Avg	Vert	95.3	30.6	2.2	0.0	36.2	91.9			PASS
2390	Peak	Horz	44.6	30.6	2.2	0.0	36.2	41.2	74.0	32.8	PASS
2390	Avg	Horz	35.0	30.6	2.2	0.0	36.2	31.6	54.0	22.4	PASS
2390	Peak	Vert	46.7	30.6	2.2	0.0	36.2	43.3	74.0	30.7	PASS
2390	Avg	Vert	35.7	30.6	2.2	0.0	36.2	32.3	54.0	21.7	PASS
Mid channel 2435											
2435	Peak	Horz	95.8	30.6	2.2	0.0	36.2	92.4			PASS
2435	Avg	Horz	94.8	30.6	2.2	0.0	36.2	91.4			PASS
2435	Peak	Vert	97.8	30.6	2.2	0.0	36.2	94.4			PASS
2435	Avg	Vert	94.8	30.6	2.2	0.0	36.2	91.4			PASS
4870	Peak	Horz	47.1	33.7	2.9	0.0	35.7	48.0	74.0	26.0	PASS
4870	Avg	Horz	40.0	33.7	2.9	0.0	35.7	40.9	54.0	13.1	PASS
4870	Peak	Vert	48.0	33.7	2.9	0.0	35.7	48.9	74.0	25.1	PASS
4870	Avg	Vert	41.2	33.7	2.9	0.0	35.7	42.1	54.0	11.9	PASS
7305	Peak	Vert	41.0	37.9	4.3	0.0	35.9	47.3	74.0	26.7	NF
7305	Avg	Vert	28.0	37.9	4.3	0.0	35.9	34.3	54.0	19.7	NF
7305	Peak	Horz	41.0	37.9	4.3	0.0	35.9	47.3	74.0	26.7	NF
7305	Avg	Horz	28.0	37.9	4.3	0.0	35.9	34.3	54.0	19.7	NF
High channel 2475											
2475	Peak	Horz	95.5	30.6	2.2	0.0	36.2	92.1			PASS
2475	Avg	Horz	93.8	30.6	2.2	0.0	36.2	90.4			PASS
2475	Peak	Vert	97.7	30.6	2.2	0.0	36.2	94.3			PASS
2475	Avg	Vert	95.5	30.6	2.2	0.0	36.2	92.1			PASS
2483.5	Peak	Horz	49.6	30.6	2.2	0.0	36.2	46.2	74.0	27.8	PASS
2483.5	Avg	Horz	38.1	30.6	2.2	0.0	36.2	34.7	54.0	19.3	PASS
2483.5	Peak	Vert	51.6	30.6	2.2	0.0	36.2	48.2	74.0	25.8	PASS
2483.5	Avg	Vert	40.1	30.6	2.2	0.0	36.2	36.7	54.0	17.3	PASS


Note the measurement shown at 2390 is the worst case measurement between 2300 and 2390 MHz.

Client	Viconics Technologies	
Product	VTP transceiver card	
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2011	

Test Equipment List

Equipment	Model No.	Manufacturer	Last calibration date	Next calibration due date	Asset #
Spectrum Analyzer	8566B	HP	12/21/ 2011	12/21/2013	GEMC 141
Quasi Peak Adapter	85650A	HP	12/21/ 2011	12/21/2013	GEMC 7
Loop Antenna	EM 6871	Electro-Metrics	Jan 31, 2011	Jan 31, 2013	GEMC 70
Loop Antenna	EM 6872	Electro-Metrics	Jan 31, 2011	Jan 31, 2013	GEMC 71
BiLog Antenna	3142-C	ETS	17-Jan-11	17-Jan-13	GEMC 137
Attenuator 3 dB	FP-50-3	Trilithic	NCR	NCR	GEMC 40
Chase Preamp 9kHz - 2 GHz	CPA9231A	Chase	8/29/2012	8/29/2014	GEMC 6403
Q-Par 1.5-18 GHz Horn	6878/24	Q-par	8/23/2012	8/23/2014	GEMC 6365
Horn Antenna 18 GHz - 26.5 GHz	SAS-572	A.H. Systems	8/27/2012	8/27/2013	GEMC 6371
18.0-26.5 GHz Harmonic Mixer	11970K	HP	21-Dec-11	21-Dec-13	GEMC 158
1-26G pre-amp	HP 8449B	HP	8/22/2012	8/22/2014	GEMC 6351
RF Cable 7m	LMR-400-7M-50OHM-MN-MN	LexTec	NCR	NCR	GEMC 28
RF Cable 1m	LMR-400-1M-50OHM-MN-MN	LexTec	NCR	NCR	GEMC 29
RF Cable 0.5M	LMR-400-0.5M-50OHM-MN-MN	LexTec	NCR	NCR	GEMC 31

This report module is based on GEMC template "FCC - 15.209 - Radiated Emissions_Rev1.doc"

Client	Viconics Technologies	
Product	VTP transceiver card	
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2011	

6dB Bandwidth of Digitally Modulated Systems

Purpose

The purpose of this test is to ensure that the bandwidth occupied exceeds a stated minimum. This helps ensure the utilization of the frequency allocation is sufficiently wide. This also helps prevent corruption of data by ensuring adequate data separation to distinguish the reception of the intended information.


Limits

The Limit is as specified in FCC Part 15 and RSS 210.

Systems using digital modulation techniques may operate in the 902 - 928 MHz, 2400 - 2483.5 MHz, and 5725 - 5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.

Results

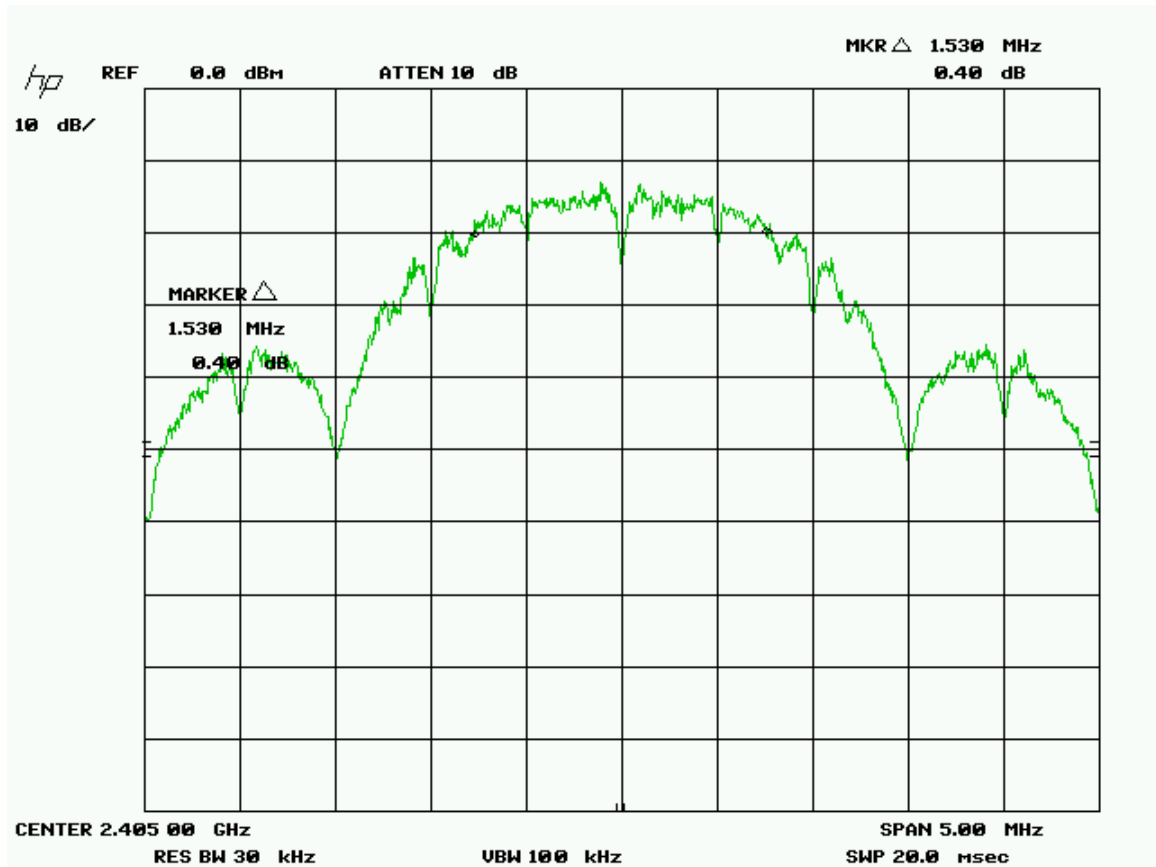
The EUT passed. The minimum 6 dB BW measured was 1.53 MHz


Client	Viconics Technologies	
Product	VTP transceiver card	
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2011	

Graph(s)

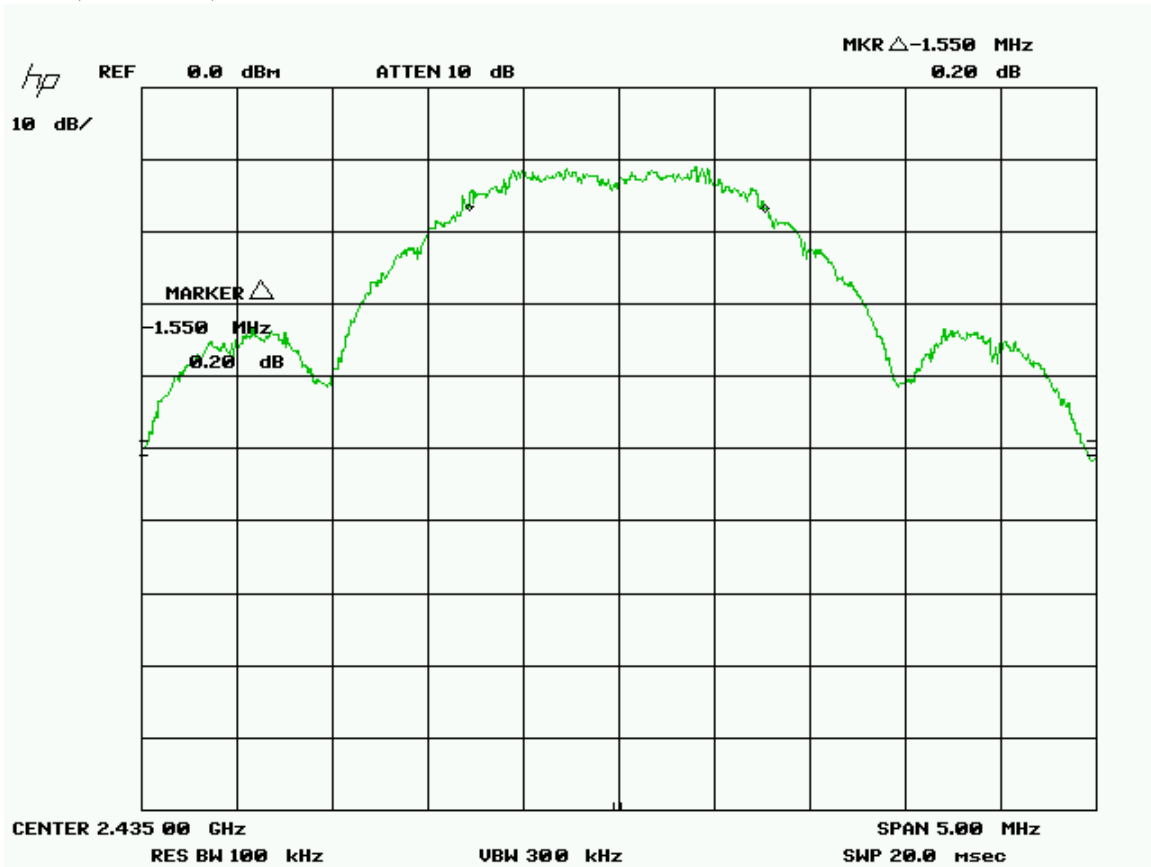
The graphs shown below shows the channel spacing during the operation of the device. This is measured by a max hold on the spectrum analyzer and the highest resolution bandwidth that is sufficiently low to exhibit the 6 dB bandwidth of a channel during operation of the EUT. This measurement is a peak measurement. Max hold is performed for a duration of not less than 1 minute.


Low (1.53 MHz)



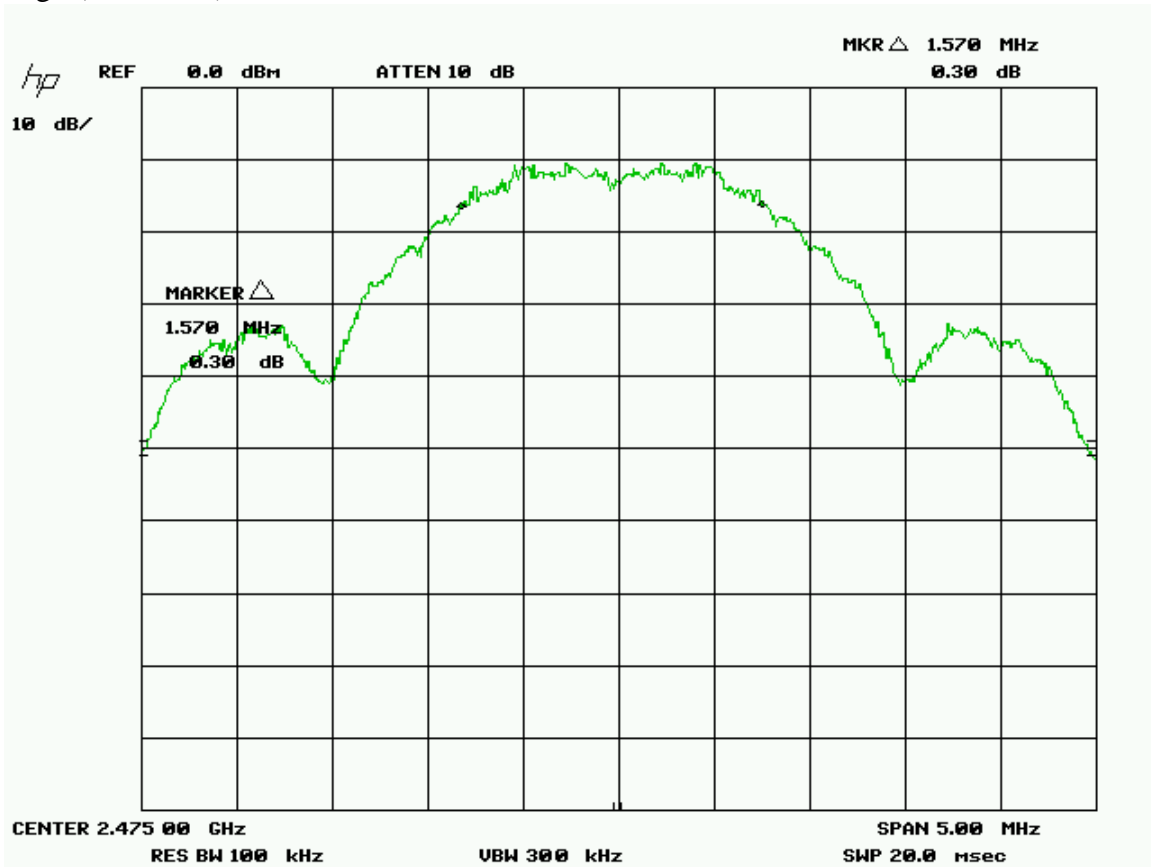
Client	Viconics Technologies	
Product	VTP transceiver card	
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2011	


Med (1.55 MHz)



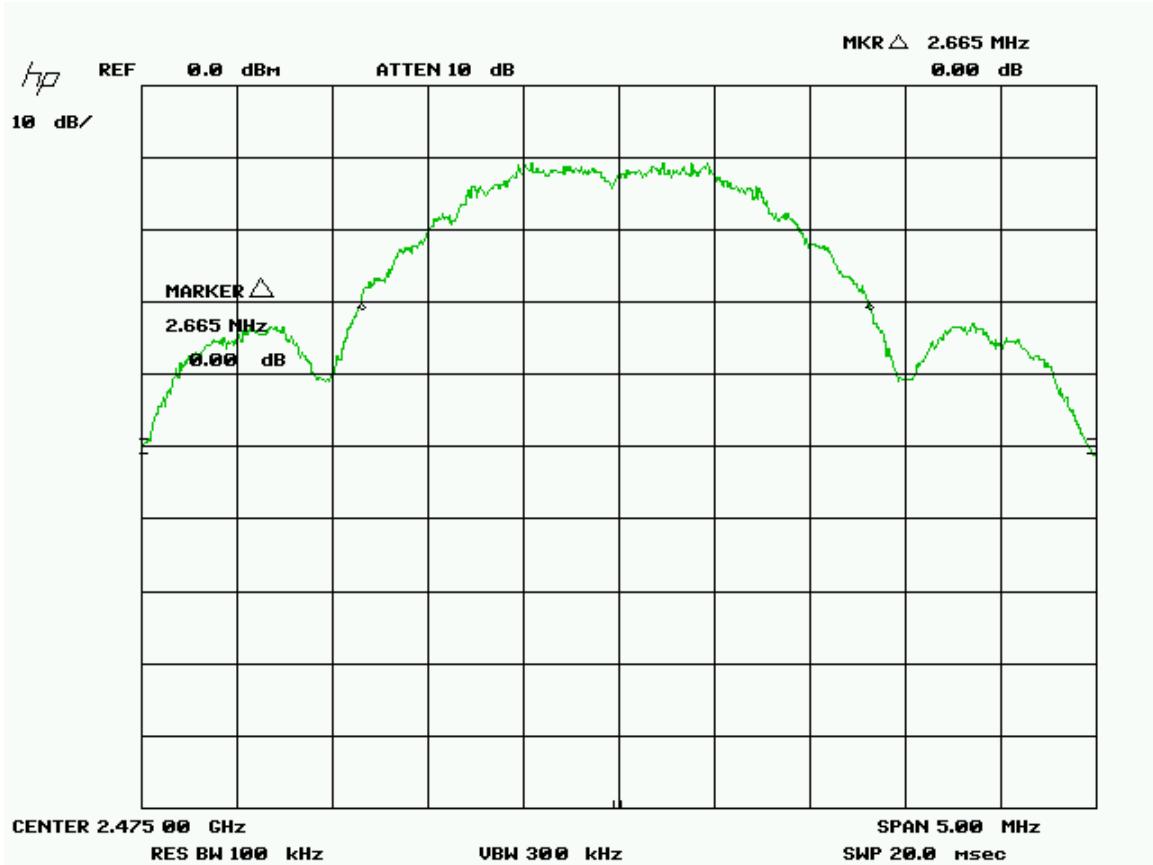
Client	Viconics Technologies	
Product	VTP transceiver card	
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2011	

High (1.57 MHz)



Client	Viconics Technologies	
Product	VTP transceiver card	
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2011	

For information purposes High channel at 20 dB Bandwidth




Note: See 'Appendix B – EUT & Test Setup Photographs' for photos showing the test set-up.

Client	Viconics Technologies	
Product	VTP transceiver card	
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2011	

Test Equipment List

Equipment	Model No.	Manufacturer	Last calibration date	Next calibration due date	Asset #
Spectrum Analyzer	8566B	HP	12/21/ 2011	12/21/2013	GEMC 141

This report module is based on GEMC template "FCC – Power Line Conducted Emissions Class B_Rev1"

Client	Viconics Technologies	
Product	VTP transceiver card	
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2011	

Maximum Peak Envelope Conducted Power - DM

Purpose


The purpose of this test is to ensure that the maximum power conducted to the radiating element does not exceed the limits specified. This ensures that if the end-user replaces the antenna, that the maximum power does not exceed an amount which may create an excessive power level.

Limits

The limits are defined in FCC Part 15.247(b) and RSS 210. For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands, the peak limit is 1 watt.

Results


The EUT passed. The peak power measured was 4.5 dBm (2.8 mW).

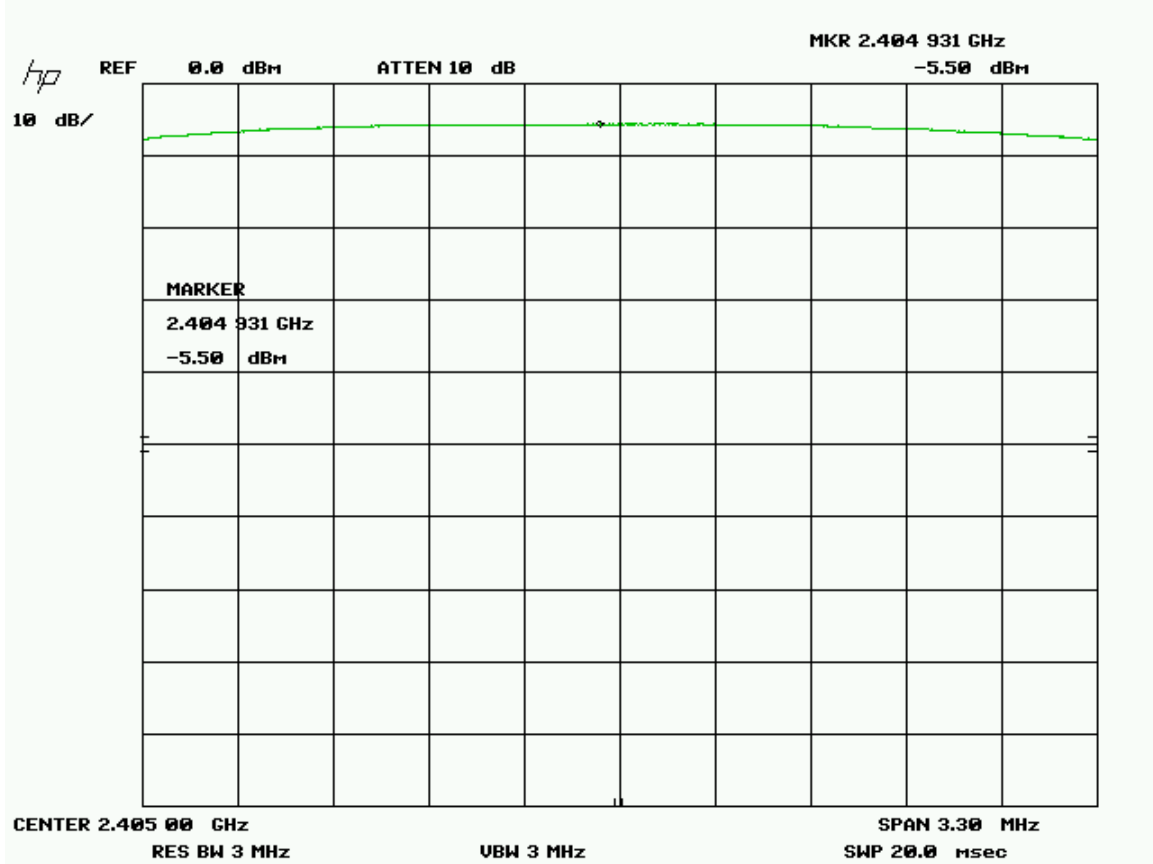
Client	Viconics Technologies	
Product	VTP transceiver card	
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2011	

Table(s)


The tables shown below shows the peak power output of the device during the antenna conducted measurement during transmit operation of the EUT.

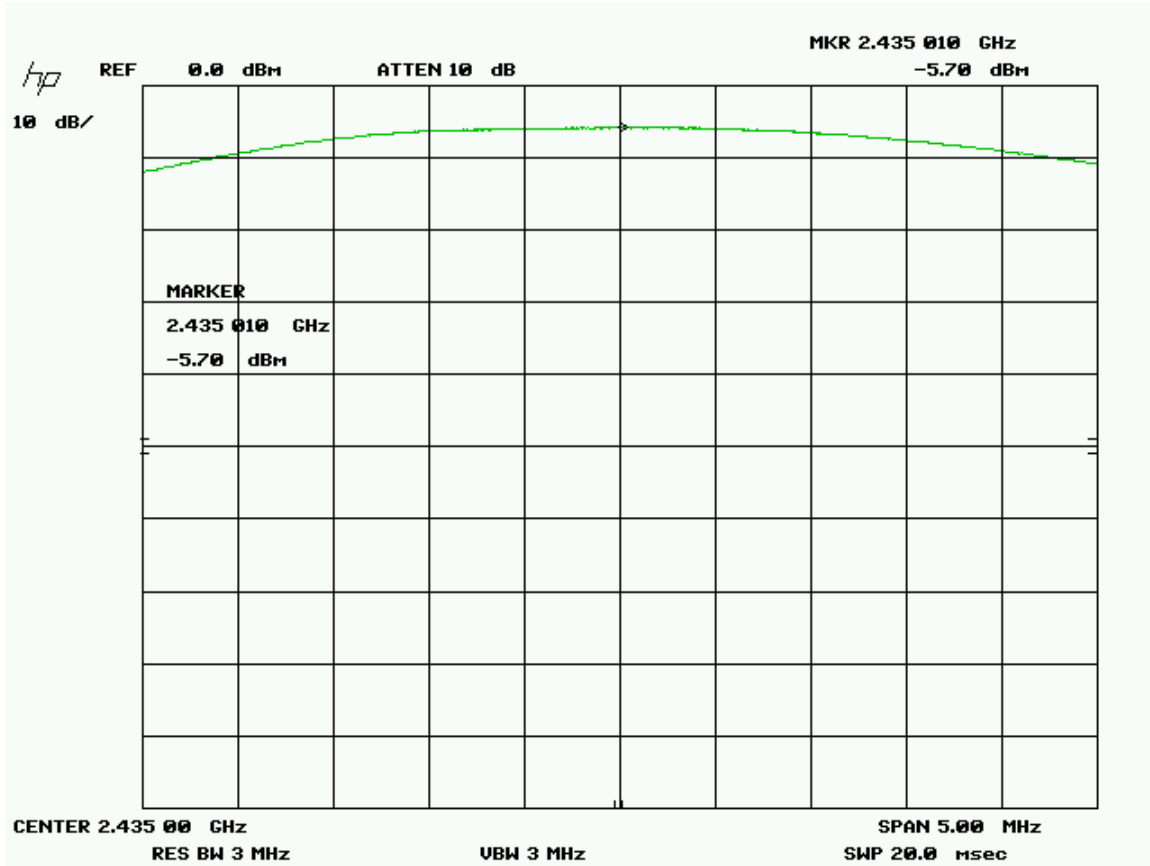
Band	Channel	Frequency (GHz)	Reading (dBm)
Low	11	2.405	4.5
Medium	17	2.435	4.3
High	25	2.475	3.9

Client	Viconics Technologies	
Product	VTP transceiver card	
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2011	




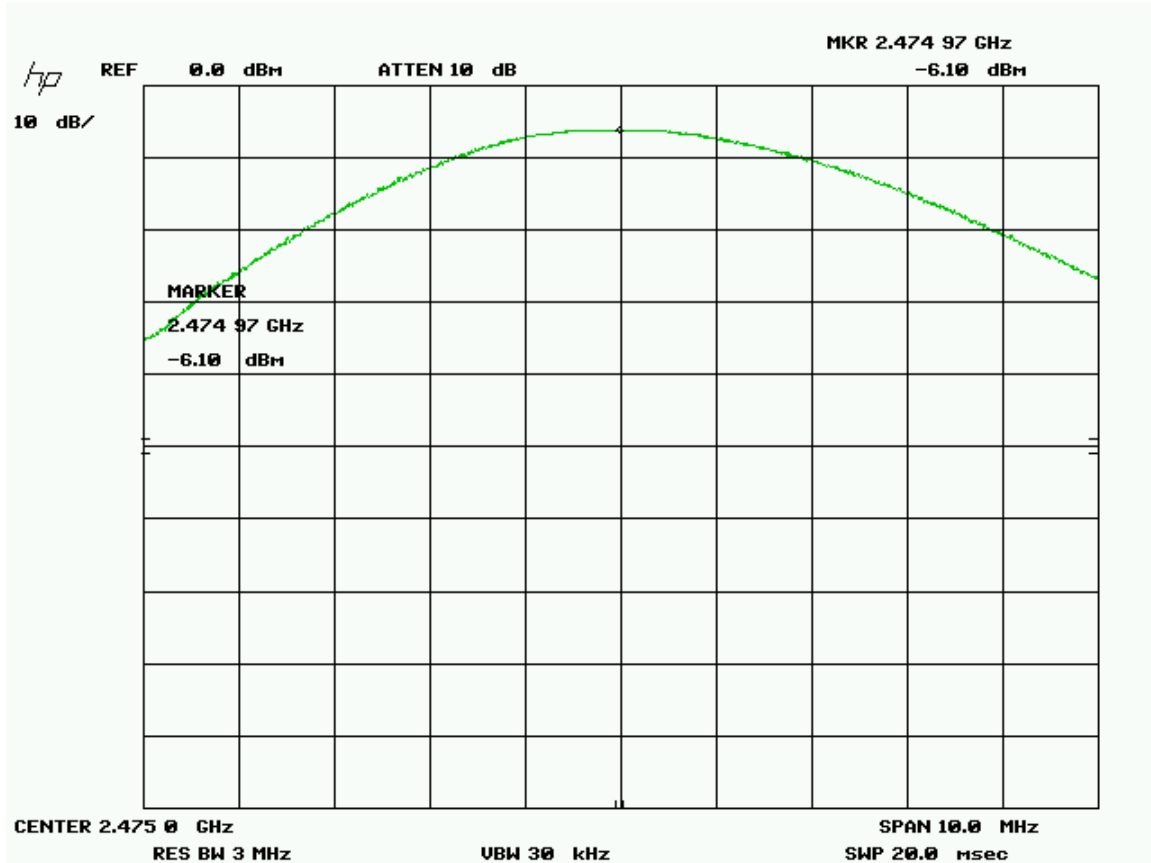
Note: 10 dB for external losses added to value shown above.

Client	Viconics Technologies	
Product	VTP transceiver card	
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2011	



Note: 10 dB for external losses added to value shown above.

Client	Viconics Technologies	
Product	VTP transceiver card	
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2011	



Note: 10 dB for external losses added to value shown above.


Note: See 'Appendix B – EUT & Test Setup Photographs' for photos showing the test set-up.

Client	Viconics Technologies	
Product	VTP transceiver card	
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2011	

Test Equipment List

Equipment	Model No.	Manufacturer	Last calibration date	Next calibration due date	Asset #
Power Head	PH 2000	AR	2011-01-31	2013-01-31	GEMC 15
Power meter	PM 2002	AR	2011-01-31	2013-01-31	GEMC 16
Spectrum Analyzer	8566B	HP	12/21/ 2011	12/21/2013	GEMC 141
RF Cable 1m	LMR-400-1M-50OHM-MN-MN	LexTec	NCR	NCR	GEMC 29
Power Attenuator 20 dB	25-A-FFN-20	Bird / Hutton	NCR	NCR	GEMC 49

This report module is based on GEMC template "FCC – Power Line Conducted Emissions Class B_Rev1"

Client	Viconics Technologies	
Product	VTP transceiver card	
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2011	

Power Spectral Density - DM

Purpose

The purpose of this test is to ensure that the maximum power spectral density to the radiating element does not exceed the limits specified. This ensures that the modulation is significantly wide enough, or low enough in power that it will allow for co-operation of other wireless devices operating within this frequency allocation.

Limits

The limits are defined in 15.247(e).


For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

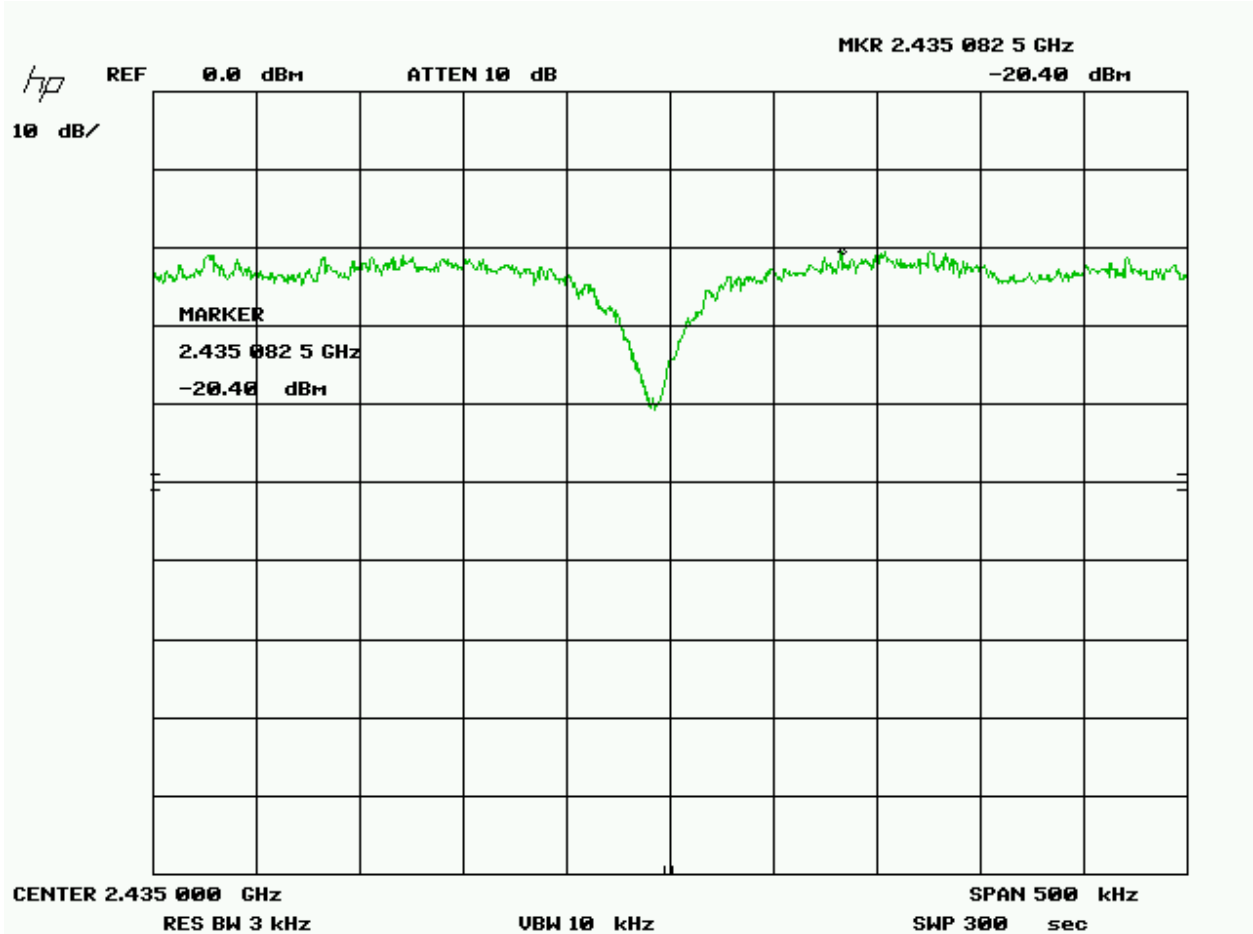
Results

Note: As the peak power is 4.5 dBm, this test is provided below for information purposes, as the product could be deemed to meet the requirement based on peak power.

The EUT passed. Each mode was tested at low, medium, and high band. The worst case value is - dBm as measured with a 3 kHz resolution bandwidth (peak power).

Low	Mid	High	
-10.4	-10.4	-11.0	PASS


Client	Viconics Technologies	
Product	VTP transceiver card	
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2011	



Graph(s)

The graphs shown below show the power spectral density of the device during the conducted measurement operation of the EUT. Low, middle, and high channel was investigated in each mode, with the worst case being presented.


Note: See ‘Appendix B – EUT & Test Setup Photographs’ for photos showing the test set-up.


Client	Viconics Technologies	
Product	VTP transceiver card	
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2011	

Test Equipment List

Equipment	Model No.	Manufacturer	Last calibration date	Next calibration due date	Asset #
Spectrum Analyzer	8566B	HP	12/21/ 2011	12/21/2013	GEMC 141
RF Cable 1m	LMR-400-1M-50OHM-MN-MN	LexTec	NCR	NCR	GEMC 29
Power Attenuator 20 dB	25-A-FFN-20	Bird / Hutton	NCR	NCR	GEMC 49

This report module is based on GEMC template "FCC – Power Line Conducted Emissions Class B_Rev1"

Client	Viconics Technologies	
Product	VTP transceiver card	
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2011	

Client	Viconics Technologies	
Product	VTP transceiver card	
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2011	


Appendix A – EUT Summary

For further details for filing purposes, refer to filing package.


General EUT Description

Client Details	
Organization / Address	Viconics Electronics Inc. 9245 Langelier Blvd. Montreal, Quebec, Canada, H1P 3K9
Phone	514-321-5660
EUT (Equipment Under Test) Details	
EUT Name (for report title)	VTP Transceiver card
EUT Model / SN (if known)	VTP
FCC ID	V95-VTP
Industry Canada #	7591A-VTP
Equipment category	Wireless module
EUT is powered using	DC
Input voltage range(s) (V)	6.5Vdc – 9Vdc
Frequency range(s) (Hz)	DC
Rated input current (A)	0.08A
Nominal power consumption (W)	0.3W
Number of power supplies in EUT	1
Transmits RF energy? (describe)	Yes
Basic EUT functionality description	EUT is a wireless module for sending data related to temperature and humidity.


Note the EUT is considered to have been received the date of the commencement of the first test, unless otherwise stated. For a close-up picture of the EUT, see ‘Appendix B – EUT & Test Setup Photographs’.

Client	Viconics Technologies	
Product	VTP transceiver card	
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2011	

Appendix B – EUT and Test Setup Photographs


Client	Viconics Technologies	
Product	VTP transceiver card	
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2011	

Note: These photos are for information purposes only. Also refer to PDF files that are separate from this test report.

Client	Viconics Technologies	
Product	VTP transceiver card	
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2011	




Radiated Emissions – Below 30 MHz

Client	Viconics Technologies	
Product	VTP transceiver card	
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2011	




Radiated Emissions – 30 MHz to 1 GHz

Client	Viconics Technologies	
Product	VTP transceiver card	
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2011	



Radiated Emissions – Above 1 GHz

Client	Viconics Technologies	
Product	VTP transceiver card	
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2011	



Antenna Port Conducted Emissions